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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,950	07/24/2001	Barry S. Carpenter	56352US002	5704

32692 7590 11/13/2002

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EXAMINER	
KNAUSS, SCOTT A	
ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 11/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/911,950	CARPENTER ET AL.	
	Examiner	Art Unit	
	Scott A Knauss	2874	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-37 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-15,21,22,27-30,32 and 37 is/are rejected.

7)☒ Claim(s) 16-20,23-26,31 and 33-36 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. The references cited in the information disclosure statement have been considered.

Claim Objections

2. Claim 12 is objected to because of the following informalities: Claim 12 recites the limitation "comprises one of an optical fiber and optical fiber" which is redundant.

Claims 13-15 are objected to because they recite the limitation "the lens" which lacks antecedent basis.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

4. Claims 1-4,7-10,12,28-30,32, and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication No. 2002/0097951 to Mortenson et al.

Regarding claim 1 Mortenson discloses in figures 1 and 5 a package for micromechanical devices with all the limitations set forth in the claims including:

A die (#22) comprising a micromechanical device (#58) on a first surface of a substrate (#50) the first surface being considered a die reference surface

A package frame (#14) having an aperture and a package frame reference surface (in this case top or bottom surface) adapted to receive the die reference surface such that the micromechanical devices are located in the aperture

One or more optical interconnect alignment mechanisms (in this case #30 and #28 on frame, and also channels formed on substrate (#50) to house fibers (see page 2, paragraph [0019], lines 17-18)), the alignment mechanisms terminated adjacent to the aperture and may be considered to be "positioned relative to an optical interface reference plane", such as the surface of substrate (#50)

Distal ends of optical fibers (#56) located in the optical interconnect alignment mechanisms and optically coupled with one or more of the optical micromechanical devices.

Regarding claim 2-4, since claim 1 merely states that the alignment mechanisms are positioned "relative" to an optical interface reference plane, the optical interface plane could be considered any surface or plane, including the die reference surface, package frame reference surface, or a plane parallel to the die reference surface located between the die reference surface and the package frame reference surface. The examiner further notes that it is not clear from the specification what exactly

distinguishes an "optical interface reference plane", and furthermore, any plane in an optical device could be considered an "optical interface reference plane".

Regarding claim 7, Mortenson discloses alignment mechanisms in both the package frame reference surface and the die reference surface.

Regarding claim 8 since claim 1 merely states that the alignment mechanisms are positioned "relative" to an optical interface reference plane, the optical interface plane could be considered any surface or plane, including a plane touching the tops of optical interconnects placed in the alignment mechanisms, which would comprise a "tangential" relationship with the optical interface reference plane.

Regarding claim 9 since claim 1 merely states that the alignment mechanisms are positioned "relative" to an optical interface reference plane, the optical interface plane could be considered any surface or plane, including a plane running through a central portion of the optical interconnects thus forming a first portion of an optical interconnect on one side of an optical interface reference plane and a second portion of the optical interconnect on another side of the optical interface reference plane.

Regarding claim 10, Mortenson discloses optical interconnects positioned in channels in substrate (#50) as stated above, thus contacting the die.

Regarding claim 12 Mortenson discloses the use of optical fibers (#56)

Regarding claims 28 and 29 Mortenson discloses an aperture (#32) comprising a cover (#16) which seals the die to the package frame.

Regarding claim 30 Mortenson discloses a printed circuit board (i.e. flexible circuit) which is electrically coupled to die (#22) (see paragraph [0013])

Regarding claim 32 Mortenson discloses plugging leads of die (#22) into holes in a printed circuit board (i.e. flexible circuit), thus the circuit board extends across a rear surface of the die, the die having vias, in this case leads (#22) which extend through the die and electrically couple the micromechanical device to the flexible circuit (see paragraph [0013])

Regarding claim 37, Mortenson discloses four optical fibers which may be coupled using a reflective mirror controlled by a micromechanical device which is packaged, which in itself can be considered an optical communications system including at least one packaged micromechanical device.

5. Claims 1,11,12,15 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by "Free-Space Fiber-Optic Switches Based on MEMS Vertical Torsion Mirrors", Lee et al.

Regarding claims 1 and 12, Lee discloses a package for micro mirror switches with all the limitations set forth in the claims in figures 9 and 11, including:

A die (bottom wafer) comprising one or more optical micro-mechanical devices (MOEMS) on a first surface of a substrate (in this case a mirror chip), the first surface being considered a die reference surface.

A package frame (top wafer) comprising an aperture and a package reference surface (in this case bottom substrate) adapted to receive the die reference surface such that the optical micro-mechanical devices are located in the aperture

One or more optical interconnect alignment mechanisms terminating adjacent to the aperture (see fig. 9) which may be considered to be "positioned relative to an optical interface reference plane", such as the surface of one of the wafers.

Distal ends of one or more optical interconnects, in this case optical fibers, located in the optical interconnect alignment mechanisms and optically coupled with one or more of the optical micro mechanical devices.

Regarding claims 11 and 15, it is apparent from figures 9 and 11 that the optical fibers and ball lenses shown terminate adjacent to the die (mirror chip) without contacting the die.

Regarding claim 27, Lee discloses on page 11, column 1, paragraph 2 bonding two two wafers using a thermally cured adhesive, which can be considered an encapsulating material.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 5,6,13,14,21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mortenson et al.

Regarding claims 5 and 6, Mortenson discloses the use of alignment mechanisms (in this case #30 and #28 on frame (figs. 1 and 2), and also channels formed on substrate (#50) to house fibers (see page 2, paragraph [0019], lines 17-18))

Mortenson does not, however specify the use of V-grooves in the package reference surface or die reference surface.

Nevertheless, the use of V-grooves is well known in fiber optics to provide optical fibers in alignment with other optical fibers or devices such as mirrors, and it would have been obvious to one of ordinary skill in the art to modify the package of Mortenson to incorporate V-grooves in the package reference surface or die reference surface in order to align the fibers with the micromechanical device #58.

Regarding claims 13 Mortenson fails to disclose the use of a lens optically coupling the optical fiber with one or more optical micro mechanical devices, in particular a lens contacting the die.

Nevertheless, the use of lenses in micromechanical switching devices, particularly switches of the type shown in fig. 5, #58, is well known in the art to collimate light entering and leaving optical fibers for the purpose of reducing light loss in an optical switch

Therefore it would have been obvious to one of ordinary skill in the art to modify the optical switch shown in figure 5 of Mortenson to include lenses at the end of each of the optical fibers in order to reduce light loss.

Regarding claim 14, it is also known in the art to place lenses on a base or substrate of an optical switch for the purpose of receiving and transmitting light from optical fibers, and therefore it would have further been obvious to one of ordinary skill in the art to provide lenses on the die disclosed by Mortenson in order to reduce light loss and couple light into and out of the optical fibers.

Regarding claims 21 and 22, Mortenson discloses a frame (#14) having an aperture, and also discloses that the frame may have other shapes depending on the shape of the die (#12) on which it is disposed, in particular a rectangular or square shape.

Mortenson does not, however, explicitly specify an aperture having a rectangular or square shape. Nevertheless, since Mortenson discloses that the die may have different shapes, it would have been obvious to one of ordinary skill in the art to provide an aperture matching the shape of the die. Regarding claim 21 in particular, Since Mortenson discloses the use of a rectangular frame, it would have been obvious to one of ordinary skill in the art to associate a rectangular die to fit into an aperture formed into the frame. Furthermore, regarding both claims 21 and 22, it has been held that more than a mere change of form or rearrangement of parts is necessary for patentability (Span-Deck, Inc. v. Fab-Con, Inc. (CA 8,1982) 215 USPQ 835).

Allowable Subject Matter

9. Claims 16-20,23-26,31 and 33-36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 16 in particular, prior art fails to disclose a package as set forth in claim 1, further comprising one or more contact pads interposed between the die reference surface and the package frame reference surface.

Regarding claim 23, prior art fails to disclose a package as set forth in claim 1, wherein the aperture comprises a cross-shape configured so that the distal ends of the optical fibers terminate in arms of the cross-shaped aperture without contacting the die.

Regarding claims 24-26, prior art fails to disclose a package as set forth in claim 1 having a tooling fixture on the rear surface of a die.

Regarding claim 31, prior art fails to disclose a package as set forth in claim 1 comprising electric traces on the package frame which are electrically coupled to contact pads in the package frame reference surface.

Regarding claim 33, prior art fails to disclose a package as set forth in claim 1 comprising a shoulder region adjacent to the optical micromechanical devices, electrical traces extending from the micromechanical device to the shoulder region, and a flexible circuit located between the shoulder region and the optical interface reference plane.

Regarding claims 34-36, prior art fails to disclose a package as set forth in claim 1 wherein the package frame comprises one or more alignment posts positioned to engage with the die reference surface, and a cavity adjacent to the alignment posts on a side opposite the aperture.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent Nos. 4,932,745 to Blonder and 5,208,880 to Riza et al. disclose optical micromechanical devices similar to the device used in Mortenson.

"MEMS Packaging for Micro Mirror Switches", Huang et al., discloses another similar packaging arrangement for optical MEMS devices.

U.S. Patent No. 6,154,305 to Dickensheets et al. discloses in figures 2 and 3 packaging micromechanical elements in an aperture which are coupled to optical fibers.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Knauss whose telephone number is (703) 305-5043. The examiner can normally be reached on 9-6 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (703) 308 - 4819. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

Scott Knauss

Art Unit 2874

sak
November 8, 2002

HEMANG SANGHAVI
PRIMARY EXAMINER